3. An understanding of the relation between river flow and inputs of sediments and chemical constituents is important for managing upstream inputs and estuarine wasteload allocations. Infrequent, high-flow events, in particular, may remove large amounts of sediment and associated constituents from storage in the rivers and transport them into the estuaries. (Simmons 1988)

4. Flow diversion and management of reservoir releases are significant issues in the Roanoke and Neuse River basins. The existence of major reservoirs in those basins offers possibilities for flow regulation to enhance water quality and fishery resources if the relationship between flow and other processes are well established.

5. Watershed modeling has been attempted in the Chesapeake basin. This capability may allow the evaluation of the cumulative effects on the estuaries of upland land-use conversions and land management strategies. Physical and chemical modeling of rivers would also be required to link upland surface drainage processes to estuarine inputs.

A. 1. b. Local Drainage Issues. The Albemarle-Pamlico estuarine system has an extensive shoreline. Lands along this shoreline support a number of uses including agriculture, silviculture, residential and urban development, and marina operations. Investigations over the last 15 to 20 years have established that drainage from urban and agricultural lands can significantly contribute to the degradation of rivers and streams (Paerl 1983).

Tributary freshwater inflow rates can exert a direct influence on Albemarle-Pamlico water quality, apart from chemical constituents carried by the inflows. For example, the increase of low flows from the Roanoke River above natural conditions has apparently resulted in a decrease in the magnitude and frequency of saltwater intrusion into western Albemarle Sound (NC Division of Environmental Management 1982). The decrease in saltwater intrusion may, in turn, have resulted in an increase in nuisance algal blooms in the area (NC Division of Environmental Management 1982). This relation has been documented by Christian et al. (1986) who showed that the occurrence of blue-green algal blooms in the Neuse River estuary was directly related to Neuse River flow rates.

Much of the land surrounding the Albemarle-Pamlico estuary must be drained to accommodate agriculture, silviculture, and other types of development due to a naturally high water table, relatively high rainfall (between about 50 and 55 inches per year, depending upon location), and the flat terrain of the region. More than 20 miles of field ditches, collector canals and main canals are typically present in each square mile of agricultural land (Heath 1975; Daniel 1978). The ditches, designed to remove runoff from a 2 inch rainfall within 24 hours (Heath 1975), may increase the rate and volume of runoff (Skaggs et al. 1980; Daniel 1981).

There is some argument about long-term and undesirable decreases in salinity of the tidal creeks and bays resulting from the increased drainage. Sholar (1980), for example, estimated that salinity in northwestern Pamlico Sound decreased at an annual rate of about 0.2 ppt between 1948 and 1980. On the other hand, between 1968 and 1986, Stanley (1988b) detected a slight increase in surface salinity near the mouth of the Pamlico River and a decrease of about 0.13 ppt per year in the bottom salinity near the mouth. Most of these changes appear to have occurred between 1968 and 1975.

In contrast to the estuaries of Texas and California, in which hypersaline conditions often exist, parts of the Albemarle-Pamlico estuarine system appear to be affected by excessive rates of freshwater inflow, especially during the spring. For example, Pate and Jones (1981) linked the impairment of nursery area function to high freshwater inflow rates associated with artificial drainage ditches. Important issues concerning local drainage of freshwater into the estuaries include the following items: